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RESEARCH DIRECTIONS AND CONCERNS IN CANADIAN COAL PREPARATION: AN OPERATIONAL PERSPECTIVE

N.E. Andersen, M.W. Mikhail, A.I.A. Salama and O.E. Humeniuk

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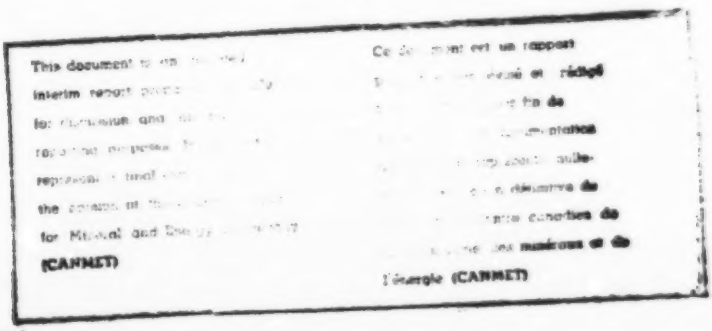
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RESEARCH DIRECTIONS AND CONCERNS IN CANADIAN COAL PREPARATION: AN OPERATIONAL PERSPECTIVE

by

N.E. Andersen*, M.W. Mikhail**, A.I.A. Salama*** and O.E. Humeniuk****

ABSTRACT

The mandate of CANMET is to enhance the role and contribution of minerals and energy to the Canadian economy .... by means of mission-oriented research and development which is supportive of R&D performed by industry. As a part of the close interaction and contacts required by this mandate during the research planning process, a total of twelve Canadian coal preparation plants were visited and discussions held with plant operational management. An industry viewpoint and feedback on several specific (current and planned) CANMET programs was obtained, together with candid commentary on recent and/or continuing operational problems in coal preparation. The responses are summarized and recommendations made in this report.

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DIRECTIONS ET QUESTIONS D'INTÉRÊT POUR LA RECHERCHE SUR LA PRÉPARATION DU CHARBON CANADIEN : UNE PERSPECTIVE DE TRAVAIL

par

N.E. Andersen*, M.W. Mikhail**, A.I.A. Salama*** et O.E. Humeniuk****

RÉSUMÉ

Le mandat de CANMET est de rehausser le rôle et l'apport des minéraux et de l'énergie dans l'économie canadienne ... au moyen d'activités spécifiques de recherche et de développement qui soutiennent la recherche et le développement réalisés par l'industrie. À cause des interactions et des contacts étroits qui doivent être établis pour remplir ce mandat pendant le processus de planification de la recherche, on a visité un total de douze installations canadiennes de préparation du charbon et des entretiens ont eu lieu avec leurs directeurs d'exploitation. On a obtenu le point de vue et les réactions de l'industrie au sujet de plusieurs programmes spécifiques de CANMET (en cours ou prévus), de même que leurs commentaires francs sur les problèmes opérationnels récents ou actuels touchant à la préparation du charbon. On a résumé les réponses et fait des recommandations dans le rapport.

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INTRODUCTION

Within Energy, Mines and Resources Canada, CANMET is the major technological research arm and is the country's leading agency for fossil fuel energy research, development, demonstration and transfer of new technology to industry. It is vital that work be carried out in response to, or in anticipation of, real needs and problems. Close links with the industry are therefore both beneficial and essential. In this regard the Ministers National Advisory Committee on CANMET (MNACC) and its predecessor, the National Advisory Committee on Mining and Metallurgical Research (NACMMR) plays an important role in CANMET's programs. The committee is a representative body formed by Order-in-Council to advise the Minister, EMR Canada and provides a national perspective on R&D needs. Committee recommendations are taken into account when formulating both short and long-term research plans. It is understood that the role and impact of the committee will be significantly strengthened in the near future.

The Research Program Office of CANMET provides the secretariat to both the MNACC main committee and the coal technology sub-committee. The majority of coal preparation R&D within CANMET is carried out within the Coal Research Laboratories (CRL) Division, in particular the Fuels Processing Laboratory (FPL) located at Devon, Alberta. Coal desulphurization studies, particularly by non-conventional preparation techniques, are presently carried out within the Mineral Sciences Laboratories (MSL) Division, Ottawa.

CONTACTS WITH INDUSTRY

A. Initiation

Historically, CANMET and its forerunners have sought to establish close contacts with industry. Its presence in Western Canada for example, dates from 1951 in Calgary, when Dr. Jan Visman gathered together a small group of scientists who were concerned with coal mining and particularly coal preparation. The MNACC and NACMMR committees are thus seen to reinforce and focus the traditional close interactions between researchers and the industry they serve.

In response to a recommendation from the coal technology sub-committee and as part of CRL's on-going efforts to maintain and expand

industry contacts, it was decided that:

1) an effort would be made to visit every coal preparation plant in Canada
2) visits would be supplanted where necessary by phone conversations and/or correspondence
3) contacts would be selected to provide, as far as possible, an operational viewpoint.

B. Objectives

The objectives of these visits may be summarized as follows:

1) to obtain feedback from industry on several areas specific to coal beneficiation projects. These were:
   (i) fines treatment including mobile plants
   (ii) deep cleaning and coal-water mixtures technology
   (iii) process monitoring and control
2) to obtain an industry viewpoint on recent and/or continuing operational problems in coal preparation.
3) to exchange information about present and planned CANMET programs and capabilities to address specific concerns.
4) to establish/renew personal contacts between CRL staff and industry personnel.

C. Scope

The following CRL personnel participated in these industry contacts. (Most visits were made during April-May, with some follow-up in the fall, 1986).

1) N.E. Andersen, Project Leader, Coal Preparation and Coal Desulphurization.
2) M.W. Mikhail, Head, Coal Preparation Section.
3) A.I.A. Salama, Research Scientist, Coal Preparation Section.
4) O.E. Humeniuk, Senior Research Technologist, Coal Preparation Section.

As previously mentioned, the majority of contacts were made with industry operational management, i.e. preparation plant superintendents, senior process engineers, etc. It is realized that feedback obtained may not always reflect the corporate policy, opinions or R&D objectives of coal

producing companies. However, these are the people on the "front line", who must deal with the aforementioned real needs and problems on a daily basis. Moreover, management personnel in Canadian coal preparation plants are now generally very experienced and have an excellent perspective of the relationships between processing, product quality and the economic realities being faced by the industry.

Discussions were generally informal and open in nature, to promote maximum exchange of comments and ideas. Companies were however, asked to complete a questionnaire on process monitoring and control.

RESPONSE FROM INDUSTRY

The following section of this report will detail feedback received from industry, particularly as it applies to the objectives #1 and #2.

A. Fines Treatment Mobile Plant

The concept of using trailer-mounted mobile pilot plants was first proposed by CRL scientists in the late 1970's. To date three such mobile plants have been designed, built and successfully field tested. Research on effluent treatment and dewatering processes has been carried out on-site; demonstrated performance has assisted coal preparation plant operators in selecting suitable equipment or modifying their dewatering and water treatment circuits to improve performance.

A mobile plant for improved recovery of fine coal was first proposed in 1981 and funds were used to acquire some of the basic equipment. Two objectives were defined at that time: 1) to optimize the recovery of fine coal and 2) to utilize state-of-the-art process monitoring and control instrumentation and techniques to assist in achieving optimum recovery. Fenco (consulting engineers) carried out the detailed design of the mobile plant during 1984-1985. The design included froth flotation and spirals with six flowsheet options possible. Different size ranges of coal would be treated in different equipment. The construction and installation of the mobile plant was tendered out; the lowest acceptable bid was approximately

$1 million, out of which $500K was allocated for process control instrumentation. The projected cost was significantly higher than anticipated; it was suggested at that time the subject should be reviewed with industry before deciding how to proceed.

Discussions took place on the mobile fines treatment plant with eleven operating companies in Western Canada and one in Nova Scotia. Six companies indicated interest in using pilot scale equipment to optimize fine coal cleaning. A majority of those expressing an opinion preferred modular equipment (e.g. skid-mounted) rather than a mobile trailer. One company suggested a hybrid type for maximum flexibility. Modular equipment mounted on skids would be used inside existing plants and could operate year-round. Two companies indicated a preference for fixed pilot plants over mobile plants. The majority indicated fine cleaning as a first priority followed by dewatering of fines. Responses are summarized in Table 1.

From the above responses, the consensus appears to be not in favour of spending well over $1 million to complete a mobile fines treatment plant. However, some operators are still interested in having skid-mounted pilot scale units (flotation cells or spirals) for testing in their plants to optimize fine coal recovery. This would require considerably less capital investment, although some ancillary equipment and a reasonable level of process monitoring and control would be required. Some operating funds would also be required to conduct the testing programs although companies would be expected to contribute to overall costs. Each case would be treated on its own merits. As a result, it is recommended that construction and installation of a mobile fines treatment plant as originally envisaged be put aside. Modular skid-mounted equipment is seen as being able to fulfill industry needs to optimize their fine cleaning circuits. This project is presently on hold; a decision on its future direction will also be influenced by other perceived priorities and the availability of resources.

B. Deep Cleaning and Coal-Water Mixtures Technology

The reduction of ash and sulphur below what is conventionally produced from existing operations is referred to as deep cleaning. Grinding the coal to very fine particles is sometimes necessary to allow additional liberation of sulphur and/or ash and in turn makes it possible to produce a

higher quality product. Specific processes are required to effectively treat very fine coal particles and produce a product meeting market requirements. Design of pilot scale (2 t/h) facilities, with seven flowsheet options, was completed under contract in 1986. The proposed design included a grinding circuit, various deep cleaning alternatives, and facilities for preparation of both coal-water mixtures (CWM) and pellets/agglomerates. The designed plant would be an addition (complement) to CRL's existing pilot plant and would allow R & D for process development and coal characterization to be carried out. Moreover, it could produce sufficient samples (wet or dry) for combustion, pipelining and market evaluation.

The concept of a deep cleaning section was originally discussed with individual research planners and industry contacts on an ad hoc basis. During this review the producing companies were made aware of the proposed facilities. Discussions were held (usually with plant management personnel) to obtain feedback on the subject, including coal-water mixtures, strategy for cleaning, pipelining of coal slurry and alternative handling strategies. The vast majority of companies responded favourably towards the concept of deep cleaning even though some appeared to have reservations about benefits to their particular operation. Interest in coal-water mixtures was good overall, although four companies felt that CWM's were not applicable to their coal, at least in the short term. All agreed that the project is of medium to long term due to the present low oil prices and soft market conditions. Some prefer the option of pelletizing rather than producing coal-water mixtures. One operator suggested that size enlargement technologies (agglomeration, pelletizing, etc.) could find use in solving existing problems, e.g. how to handle recovered superfine coal dust. Pipelining of CWM is one way to reduce transportation cost. However, some concerns were expressed regarding the availability of markets that could justify a dedicated pipeline. Furthermore, several indicated that this is a project that should be carried solely by the government due to the long term objectives (10-15 years).

As indicated by on-going activities in other countries on coal-water mixture preparation and utilization, Canada cannot afford to wait or depend solely on developments elsewhere. The potential for large scale applications in the next five to ten years would appear to be limited due to projected oil prices. However, beyond 1995 the demand for CWM will likely increase as oil prices are expected to rise. R&D on coal-water fuels has to date been

primarily confined to Atlantic Canada. Installation and commissioning of the 2 t/h facility at Devon is projected to take 3 to 5 years (depending on the availability of funds) and will be carried out in three phases. At least several years of in-house R & D work would be necessary to characterize a spectrum of Canadian coals and establish their potential. Combustion tests at ERL, Ottawa and pipelining tests at a suitable facility such as the Saskatchewan Research Council would also be required. By 1995 samples could be available to potential customers for evaluation and to generate the engineering data and design parameters required for commercial scale application. It is felt that this project should be supported and should proceed without delay.

C. Coal Preparation Process Control

Background

Application of process control techniques in coal preparation is expected to achieve: flexibility of operation, improved plant performance and product yield, better utilization of manpower, tighter quality control and minimization of production cost. Successful implementation may improve coal preparation plant recovery by as much as 5%.

Distributed process control systems generally prove to be superior to direct digital control systems, especially in back-up capabilities and overall system flexibility. Accordingly, in 1981, the Fuel Processing Laboratory (FPL) of CANMET, began development of a distributed process control scheme for the various circuits in its comprehensive pilot plant facilities at Devon, Alberta. Moreover, the pilot plant is being used to develop, test and evaluate various process control strategies and on-line instrumentation before recommending them for industrial use.

Part of the effort in process control R&D at FPL is carried through research contracts, two of which were on control systems for heavy medium and froth flotation circuits. The developed heavy medium control system is installed in the pilot plant for testing, further development and improvement. The design of a computerized process control system for the flotation cells in the CRL pilot plant is complete. At present, in-house expertise is being utilized to implement the sequential start-up and shut-down of the pilot plant.

Industry Contacts

To support the process control development program, this program review included an industry-wide survey, with two main objectives:

- identify industry needs and problem areas,
- generate industry feedback as an input to CRL's planning and overall strategy.

A questionnaire aimed at fulfilling the above objectives was prepared and hand-delivered or mailed to twelve coal washeries across Canada; seven responses were received. Questionnaire format is shown in Table 3. In general, all the respondents were in favour of pursuing process control R&D. However, one of the companies stated that present economic restraints are creating an unfavourable atmosphere for any new developments. When asked which circuits in the washery are most problematical and need the most attention, four respondents mentioned flotation cells; three indicated thermal drying, two mentioned the refuse thickener and one had on-going problems in jig control. With regard to on-line instrumentation, five respondents indicated a real need for ash monitors; one mentioned a sulphur monitor.

Details of industry response to the questionnaire will be included in a comprehensive report on process control (authored by Dr. A. Salama) now in preparation.

The area of process control was also discussed informally with the majority of plant operators visited. A summary of these responses is shown in Table 4. Again, a reliable, reasonably-priced on-line ash monitor was the item most often mentioned. A variety of specific problem areas, lack of monitors, control strategies for specific circuits, etc. were put forward. In some cases a lack of available resources would limit response to process control shortcomings.

D. Operational Problems in Coal Preparation

One objective of these industry contacts was to obtain information on recent and/or continuing operational problems in coal preparation from people closely associated with these problems on a daily basis.

Most contacts were reasonably familiar with CANMET's coal preparation R&D programs and facilities, although some were misinformed about the organization and mandate of the three occupants of the

Coal Research Centre at Devon. Hopefully, these visits have reinforced industry awareness of CANMET's role in coal preparation R&D. Discussions then focussed on areas of concern to industry, i.e. where they felt we should be concentrating our efforts, which new projects or areas of research should be initiated and how we could co-operate in defining objectives and addressing specific concerns. Relevant comments are summarized in Table 5. It is to be kept in mind that not all details of the discussions are included; rather it is an attempt to fairly reflect the main concerns and interests of industry as expressed to CANMET.

It is apparent that fine coal preparation continues to be a primary concern of the majority of operators. A number of plant operators have tested or are contemplating spiral cleaning units, usually as an alternative to water-only cyclones. The feeling was expressed by some operators that flotation circuits could be improved (especially in terms of tailings ash) but that the best way to achieve this was not clear.

Dewatering, particularly of (froth) product by disc filters, was a significant problem in four washeries. Dewatering of tailings to meet disposal requirements would appear to be less urgent.

It is also apparent that most operations have problems related to handleability. Western coals are particularly friable and known for their dustiness. Thermal drying usually compounds handleability problems.

Coal in railway cars is routinely sprayed with a surface sealant to minimize dust losses during transportation. This procedure, while far from perfect, appears to work reasonably well. A number of operators, however, expressed concern about coal freezing in rail cars and remaining in place after unloading at the terminal. This "carry-back" represents a direct loss to the coal producer, i.e. in terms of freight paid for coal not delivered to market.

All operators were concerned with transportation and the high proportion of product price that railway charges represent. Potential alternatives, e.g. pipelines, were seen by several operators as being a deterrent to future freight rate increases.

CONCLUSIONS AND RECOMMENDATIONS

As a result of the plant visits, discussions and both written and verbal response from operational management, the following perspectives emerge:

1) Fines treatment (mobile plants)
   - the fines treatment mobile plant as originally planned (trailer) should be modified to a modular concept (skid-mounted individual process units)
   - the perceived usefulness of mobile plants rank in the following order: fines treatment, dewatering, water treatment

2) Deep cleaning and coal-water mixtures technology
   - work on deep cleaning should be supported as a long-term project
   - market potential/development seen as major drawback to use of coal-water mixtures

3) Process control
   - continuing need for accurate and reliable process monitors particularly on-line ash/sulphur monitors
   - process control strategies need to be pursued, especially to maximize the yield of flotation circuits and to stabilize and improve the moisture control on plant products

4) Operational concerns, interests
   - processing and handling of fines continues to be a major concern
   - dewatering of fine coal remains difficult
   - problems in dewatering/disposal of tailings and in water treatment have diminished from their former high level.
   - an increased effort is required in the area of handleability, especially in dust control and the

elimination of carry-back problems due to freezing.

- handleability problems which are health and safety concerns, e.g. dust explosions, hot spots, spontaneous heating/combustion, methane release etc. require site-specific responses.

In conclusion, it must be noted that the visits and contacts with industry were very beneficial to the FPL staff concerned. We came away with a reinforced appreciation of industry concerns and viewpoints. Perhaps more importantly, it is apparent that the industry is striving to improve the efficiency of their plants under difficult economic and operating conditions. Now, more than ever, research and development must focus on that improvement.

TABLE 1 Fines Treatment Mobile Plant

Project Elements: Overall Perception; Mobile Trailer vs Skid-Mounted Individual Units; Related Comments; Priority* of Mobile Plants (A-fines treatment, B-dewatering, C-water treatment)

* Overall perceived usefulness, including existing dewatering (2 modules) and water treatment mobile plants.

Company	Response
1	Positive; skid-mounted units preferred; on-site work preferred because of live process streams. All options of fines treatment mobile plant are applicable; priority: A.
2	Limited interest; skid mounted units preferred but space in washery is limited; mobile plants seen as useful to fill in gaps or to provide direction for future efforts. Are presently doing testwork using spirals; priority: A,B.
3	Positive; no preference; treatment of fines continues to be a high priority. Have successfully closed water circuit; priority: A,B
4	Positive; prefer trailer but ability to remove individual units would increase flexibility, e.g. being able to operate in winter; priority: A, (B and C equal).
5	Negative; prefer to deal with equipment suppliers e.g. use and test smallest available commercial units. Putting in spiral concentrators. Fixed pilot plant seen as more useful.

6 Positive; prefer skid-mounted units; some tests run using spirals, with good results; priority: A,B.

7 Positive; favour modular units which can be brought into plant; much space available in washery to set up and evaluate various fine coal cleaning options; priority: A,C.

8 Qualified interest; dewatering is of particular interest. Cost sharing would be difficult due to paucity of R&D funds; priority: B.

9 Positive; prefer skid-mounted units; some interest in spirals, none in flotation; priority: A and B equal.

10 Negative; no real need for ; priority: B.

11 Indifferent; skid-mounted individual units probably preferred; have purchased spiral concentrator, not tested yet; priority: A,B.

12 Negative; mobile plants perceived as having limited use; prefer fixed pilot plant; priority: B (possibly).

TABLE 2 Deep Cleaning and Coal-Water Mixtures Technology

Project Elements: Overall Response; Interest in Coal-Water Mixtures; Related Comments

Company	Response
1	Positive; interested in CWM; some work with Carbogel was carried out, no immediate economic application. Concerned about potential markets for CWM. Enquired about cost sharing/ cost recovery on tests involving grinding, deep cleaning and size enlargement.
2	Neutral; some qualified support; would depend on potential market, existing contracts, corporate policy.
3	Positive; no interest in the short-term, lack of market for CWM; R&D should be carried by government.
4	Positive; no interest in CWM as they are essentially tied to the met coal market; feel that improved size enlargement technologies may be applicable now.
5	Positive; CWM's not seen as being relevant in the short-term; flotation column should be included in deep cleaning process options.
6	Positive; interested in CWM; some work done on dense coal slurries. Feel project should go ahead now.
7	Positive; interested as a long-term priority.
8	Positive; interested; slurry fuels are seen as a potential means to significantly increase coal usage in Canada. Work at Devon would complement work on-going in Atlantic Canada (e.g. Carbogel).

9 Negative; no interest at this time.

10 Positive; good interest; possible use of existing pipelines in future would reduce transportation costs.

11 Positive; some interest, suggested we talk to potential users of CWM. Work required on flotation.

12 Positive; interested as a long term project.

TABLE 3 Questionnaire Submitted to Industry

Re: Process Control Development

General Overview

CIRCUITS:

Heavy Medium Vessel
Heavy Medium Cyclone
Jig
Hydrocyclone
Flotation
Dewatering
Drying
Water Treatment

1. What method(s) of quality and/or process control are used in the plant. Are they reliable/adequate for your purposes.

2. Does the plant use in-line monitoring, for what purpose and where.

3. Which circuit do you believe the plant would benefit most from in-line monitoring and process control, i.e. list your circuit priorities (in order) and what you feel needs to be controlled.

4. Which circuit(s) are most problematical and need most attention in terms of maintaining or achieving optimum performance. Can you estimate losses of product and/or costs associated with present performance and gains that could be achieved with process control.

5. Has any attempt been made in the past to implement process control and later discontinued?. If so, can you describe the instrumentation and what the problems were with it.

Specifics

1. If I specify the on-line process control activities as:
   Monitoring and trending
   Sequential start-up and shut-down
   Simple control loops
   Process optimization
   Adaptive control
   Please mark 'X' in front of the activity which applies to your plant.

2. If I specify the off-line process control activities as:
   Density separator modelling
   Size separator modelling
   Flotation modelling
   Crusher modelling
   Thickener modelling
   Please mark 'X' in front of the activity which applies to your plant.

3. On the simple control loop level, what type of control schemes (PI, PID or otherwise) are used and on what process variables are implemented.

4. On the simple control loop level, please indicate the type of control scheme used (analog or digital).

5. On the circuit level (jig circuit, HMC circuit, WOC circuit, flotation circuit, water recovery circuit etc.), please indicate the control strategy used.

6. On the plant level, please indicate the control strategy used.

7. What type of computer systems are used for on-line process control.

8. Your experience with the computer system you have in terms of reliability, industrial environment etc.,

9. Whay type of computer models are used for off-line process control or prediction or evaluation.

10. Any other comments.

TABLE 4 Coal Preparation Process Control

Company	Relevant Comments
1	On-stream ash analyser needed; improvement needed in monitoring of mined coal quality, especially in relation to high ash, oxidation state.
2	PLC's being installed, interfaced to computer for data manipulation; on-line analysers required at a reasonable cost.
3	Interest in coal blending for plant optimization; developed their own programs; process control in general seen as priority.
4	Flotation circuit controls needed; ash monitor would help greatly but is too expensive.
5	Interested in specific applications.
6	Not interested at this stage, no resources available to make changes.
7	Seen as a potential means of cost reduction, especially in minimizing loss of coal to rejects.
8	On-line sulphur analyser important.
9	-
10	Have engaged consultants to look at their PC systems, especially thickener control and dryer modifications. Interested in moisture meters and ash monitor.

11 Significant interest; worked on NCB ash monitor, some problems in sampling and sample preparation. Continuous bin level monitors not available; density and solids concentration monitors need improvement, transducers seen as main problem. Start-up and shut-down procedures are good, interlocks work.

12 PC considered important, but no funds available to make changes. Moreover, it would be difficult to implement PC in this plant.

TABLE 5 Summary: Operational Concerns, Other Priorities and Interests

Company	Comments
1	- Have changed mining practice, resulting in higher plant feed ash. - Dust control seen as important; still a factor in marketing, visible dust especially bad for industry image. - Improved fine coal recovery a priority; application of technology, e.g. oil agglomeration, to recover coal from tailings ponds. - Some concern about freezing; carry-back in winter may average 1 t/car. - A combination of short and long-term projects desirable, but short term benefits are an economic reality.
2	- Cake release (discharge) from disc filters is poor; possible use of resonance frequencies. - On-going effort to optimize plant operation, doing as much R&D in-house as possible. - Blending required to keep sulphur below contract specification. - Dust problems severe in winter, especially "freeze-dried" dust in coal silos. Interested in oil-based suppressants. - Coal dried to 6% moisture; some freeze-up problems, "thaw" sheds at port do help.
3	- Treatment of fines continues to be a high priority. - No serious problems in dust control; feel that dust control measures should be "built-in" to plant; belt scraper improvement required. - Operator training considered very important; in-house videos used as an aid in training. Has resulted in,

e.g. a substantial decrease in reagent consumption.
- Freezing problems are minimal.
- Perception that CRL is spread very thin.

4
- Fines treatment continues to be priority; philosophy is "make best use of what we have"
- Freezing in rail cars and carry-back is a continuing problem.

5
- Improvements to fine coal cleaning circuits being made in-house.
- Spiral concentrators replacing secondary water-only cyclones; should improve tailings ash by 10-15%.
- Some concern about security of (critical) magnetite supply. Interested in study and report on magnetite recovery.
- Some problems in freezing; carry-back may average 2t/car during height of winter.
- CSR (coke strength after reactivity) should be looked at as a lever to marketing.

6
- Elimination of bottlenecks to increase throughput of plants, particularly disc filters.
- Still having dust problems (handleability).
- Moisture in clean coal kept at $\leq$ 5% in winter to prevent freezing.
- Plant operating well below capacity.

7
- Jigs not operating up to specifications.
- Minimize fine coal losses e.g. dryer dust.
- Cost/usage of polymeric chemicals needs to be reduced.
- Thickener operation should be improved.
- Concerned about drying; using spray-on dust suppressant.
- Looking at a number of alternatives re: cleaning of 0.5 X 0.1 mm coal.
- Plant operating at significantly less than capacity.

8
- Some concerns about fines handling, particularly dewatering; no dust problems.
- Interested in trace element analysis in coal products.
- Interested in ash fusibility.
- Concerned about methane release from coal during transportation/storage.

9
- Customers complain about dustiness of coal.
- Interest in pelletizing to improve handleability but feel it is too costly.
- Spray tops of rail cars; not completely satisfactory.

10
- Dewatering of fines very important; looking at alternatives to disc filter.
- Water treatment has been a severe problem in the past; presently working well.
- Dust control; adding a suppressant to dryer cyclone dust.

11
- Some dust problems remain in conveyors and silos; methane monitors a necessity.
- Tailings dewatering and disposal is a problem.
- Standards should be developed for the wear resistivity of steel, ceramic, rubber and plastic materials.
- Need to correlate variability of raw coal to flotation response; not all problems may be related to oxidation.

12
- Dewatering and disposal/impoundment of tailings seen as a common industry problem.
- Significant dust problems, especially around open stockpiles.
- Methane release (desorption) and "hot coal" after drying are health and safety concerns.

- Some concern about effect of oxidation on end-use properties.
- Freezing problems usually occur for 6-8 weeks in winter. Plan to test new release agent this season.

APPENDIX

Company Name	Contact(s)
Luscar-Sterco (1977) Ltd.	M. Ennis, B. Latimer
Byron Creek Collieries Ltd.	D. Thomas
Westar Mining Ltd.	G. Brust, A. Bruemmer
Obed Mountain Coal Co. Ltd.	J. Hinds, J. Pozniak
Gregg River Resources Ltd.	B. Payne
Cape Breton Development Corp.	J. Campbell
Fording Coal Ltd.	J. Hoover
Cardinal River Coals Ltd.	M. Bracko, M. Forbes
Teck-Bullmoose Coal Inc.	W. Nickel, T. Smith
Quintette Coal Ltd.	J. Hogg
Crows Nest Resources Ltd.	J. Van den Broek, H. Stellmach
Smoky River Coal Ltd.	W. Hampson, R. McCaig